Ethno-Pedagogy Learning Management Innovation Through Indigenous Herbal Knowledge to Promote Green Citizenship of Students in the Greater Mekong Subregion Area

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Abstract

This research project aimed to: 1) study the process of transferring indigenous herbal knowledge in the Greater Mekong Subregion area; 2) design and develop an ethno-pedagogy learning management innovation through indigenous herbal knowledge to promote green citizenship of students in the Greater Mekong Subregion area; and 3) investigate the results of using the ethno-pedagogy learning management innovation through indigenous herbal knowledge to promote green citizenship of students in the Greater Mekong Subregion area. This study employed a Participatory Action Research (PAR) approach. The research sample comprised three groups, totaling 127 participants: 1) 20 individuals who provided data on the process of transferring indigenous herbal knowledge, selected using Snowball Sampling; 2) 7 evaluators for the suitability of the learning management innovation, selected using Purposive Sampling; and 3) 100 students for the experimental use of the learning management innovation, also selected using Purposive Sampling. The research instruments included: 1) in-depth interview forms; 2) an evaluation form for the suitability of the learning management innovation; 3) a green citizenship assessment form; and 4) group discussion record forms. Qualitative data were analyzed using Content Analysis, while quantitative data were analyzed using statistical software to determine means and standard deviations. The results of the analysis are presented in a descriptive format.

1) The study of the process of transferring indigenous herbal knowledge in the Greater Mekong Subregion area can be categorized into three approaches: 1) the process of transferring indigenous herbal knowledge utilized for medicinal purposes, 2) the process of transferring indigenous herbal knowledge utilized for culinary purposes, and 3) the process of transferring indigenous herbal knowledge utilized for cosmetic purposes.

2) In designing and developing the ethno-pedagogy learning management innovation through indigenous herbal knowledge to promote green citizenship of students in the Greater Mekong Subregion area, it was found that the research team designed a learning management innovation called CMIL of learning management approach through indigenous herbal knowledge, which was deemed to be at the highest level of appropriateness.

3) The study of the results of using the ethno-pedagogy learning management innovation through indigenous herbal knowledge to promote green citizenship of students in the Greater Mekong Subregion area revealed that students exhibited a high level of green citizenship.

Keywords: learning management innovation, indigenous herbal knowledge, process of transferring, indigenous, green citizenship

1. Introduction

The implementation of the United Nations, Sustainable Development Goals (SDGs) 2030 aligns with Thailand's national education standards, which are consistent with the attributes of "Thai People 4.0." These attributes comprise three key characteristics: First, students are diligent learners with lifelong learning skills to keep pace with the digital and future world. They possess competencies derived from diverse knowledge and understanding, appreciate,

preserve, and apply Thai wisdom, and have life skills to create sustainable livelihoods based on sufficiency, life security, and a good quality of life for themselves, their families, and society. Second, students are co-creators of innovation, possessing intellectual skills, 21st-century skills, digital intelligence, creative thinking skills, cross-cultural skills, and interdisciplinary integration competencies. They also exhibit entrepreneurial qualities to collaboratively create and develop technological or social innovations, enhancing opportunities and value for themselves and society. Third, students are active citizens, embodying patriotism and local pride, discerning right from wrong, and possessing a conscience as both Thai and global citizens. They are volunteers with ideals and actively participate in national development based on democratic principles, justice, and equality for sustainable natural resource and environmental management, fostering peaceful coexistence in Thai society and the global community. (Office of the Secretariat of the Education Council, 2011; Office of the National Economics and Social Development Council, 2018; Mangkhang, 2022a) These three competencies are crucial for developing the nation's citizenry and fostering strong citizenship. Educational management in all countries prioritizes and aligns with global agendas such as the SDGs, further influenced by rapid globalization, which brings about swift changes in social, economic, political, technological, scientific, and environmental spheres.

Education serves as the primary mechanism for developing a high-quality workforce, recognizing that nations with a skilled populace advance more significantly. Consequently, enhancing educational quality forms the fundamental bedrock for the development of all countries, particularly Thailand, which has consistently prioritized human resource development as a key focus in every National Economic and Social Development Plan, ensuring continuous progress through its educational management system (Department of Academic Affairs, Ministry of Education, 2009). Achieving balanced and sustainable national development necessitates strengthening existing national capital to drive the development process, especially by empowering human capital to adapt to 21st-century changes (Office of the Education Council Secretariat, 2011). To prepare citizens for these new century transformations, education for all must be emphasized, ensuring equitable access for every citizen and promoting decentralization to encourage community participation in educational management that aligns with local conditions and needs (Mangkhang, 2017). This approach fosters equal value between centralized and local knowledge, while also emphasizing place-based education as a crucial foundation for local development, leading to sustainable development for all. Therefore, educational management must integrate local identity into social studies learning, encompassing diverse learning dimensions such as community history, community geography, ethnocultural traditions, Buddhist art history, and eco-culture (Mangkhang, 2022b). Attaining the goals of education for sustainable development, as outlined in Thailand's National Education Plan, which focuses on empowering citizens to be resilient, aware of social and environmental changes, and capable of living balanced lives, critically requires tangible integration of local communities into educational management. Community involvement extends beyond resource support to include serving as vital learning resources, transmitting local wisdom, culture, and ways of life that form the foundation of sustainability. Linking the curriculum to community contexts, whether economic, social, or environmental issues, fosters meaningful, tangible learning that students can apply in real life. Participatory learning, which allows youth to engage in hands-on community activities—such as learning about natural resource management, promoting local occupations, or preserving the local environment—cultivates responsible citizenship, builds attachment to their locale, and develops essential skills for effectively facing future challenges. Establishing mechanisms that facilitate knowledge exchange among schools, communities, and all stakeholders is therefore paramount to genuinely driving education for sustainable development.

Community-based learning (CBL) is an educational strategy that empowers students to define their learning objectives, utilizing the vast resources of the community to support their educational journey. This approach yields comprehensive learning outcomes spanning academic knowledge, practical and vocational skills, personal and social development, administrative and ethical values, and an understanding and utilization of community resources (Owens & Wang, 1996). Furthermore, CBL promotes learning from real-world contexts, providing direct experiential knowledge that fosters more authentic and sustainable learning than textbook-based instruction. Historically, the learning processes within communities have been natural and continuous, with knowledge traditionally created, transmitted, and applied within the community itself (Dulyakasem, 2004). Integrating local wisdom into educational management is therefore crucial for enhancing educational quality, particularly in promoting "ethno-pedagogy" aimed at fostering understanding of cultural heritage and community knowledge. Incorporating local wisdom into the curriculum enables learners to concretely connect theoretical knowledge with their social and cultural contexts, making learning more meaningful and relevant to their daily lives. This not only strengthens essential skills and knowledge for living within the community but also instills a sense of belonging, cultural pride, and appreciation for inherited wisdom. Participating in learning local wisdom also cultivates a shared consciousness for preserving and

developing their own community, which is fundamental to creating "active citizens" who are socially responsible and capable of applying traditional knowledge to solve problems and sustainably develop their locality in the future.

Knowledge management of herbal wisdom within communities is critically important for preserving cultural heritage and social capital. This process involves collecting indigenous herbal knowledge, which includes both the community's internal resources and the tacit knowledge held by community elders. This knowledge, accumulated through extensive experience, skills, and practices passed down through generations, often exists in forms that cannot be easily written down. Through effective knowledge management processes, the community context can be understood, allowing for the comprehensive documentation and formalization of this collected herbal wisdom into books, manuals, documents, and textbooks. These tangible outputs facilitate the transfer of herbal wisdom, enabling exchange and learning between community elders and younger generations. This fosters understanding and appreciation for the cultural heritage of herbal knowledge, promoting its conservation and safeguarding against loss, thereby ensuring its sustainable transmission (Nakeesang, 2016; Panmuang, Teerapattanawong, Rattanachomphu, 2023). The study and management of herbal wisdom in communities are fundamental to preserving and expanding invaluable local knowledge. This process not only involves collecting, systematizing, and transmitting ancestral knowledge to new generations but also includes scientifically analyzing and evaluating the value of herbs to ensure their appropriate and safe utilization. Therefore, community herbal knowledge management should integrate both inherited local wisdom and modern scientific principles to foster a deep and comprehensive understanding among learners and community members. This type of learning enhances awareness of herbs as natural resources and cultural heritage, while promoting the sustainable application of herbal wisdom in healthcare and community economic development, emphasizing the importance of lifelong learning and community participation in managing their own knowledge.

Integrating indigenous plants as a foundation for learning in education also promotes the application of cultural ecology, which explores the dynamic relationship between humans and nature, and nature and culture (Wannasiri, 2007). This involves studying the evolution or changes resulting from a society's continuous adaptation to its environment. These adaptations are fundamentally driven by production technology, social structure, and natural environmental conditions (Satsa-nguan, 2008). This approach is well-suited for examining adjustments related to the struggle for survival, helping us understand the intricate connections between human populations and the social and physical environments of specific communities or societies. Furthermore, the concept of eco-cultural heritage, particularly through indigenous herbal wisdom, reflects the profound relationship between nature, geo-culture, and community livelihoods, all of which are transmitted within local areas, transforming them into valuable cultural heritage spaces. The explicit articulation of indigenous herbal knowledge can lead to the development of robust knowledge bases and community-based learning management innovations that are essential for fostering active citizens committed to sustainable environmental management.

The concept of active citizenship within the dimension of green citizenship represents a concerted effort to foster greater public and governmental engagement in environmental management. Regardless of societal development, citizens must consistently play a vital role in developing and caring for natural resources. This framework provides a new paradigm for redefining individual social roles related to the environment (Amin, A., et al., 2002; Harbo, S., et al., 2017). Therefore, educational management must focus on cultivating public consciousness, instilling a sense of duty to conserve and protect natural resources and the environment. Moreover, green citizens must actively seek solutions for the coexistence of humanity, technology, and the environment in future societies. This imperative arises from the phenomenon of a disruptive society, where humanity endeavors to adapt to profound societal changes and the erosion of traditional beliefs. Societies face new phenomena stemming from migration, natural disasters, environmental shifts, technological advancements, population decline, economic fluctuations, political shifts, and pandemics—all situations that fundamentally alter future human lifestyles (Bedri, de Frein & Dowling, 2017). This societal transformation, characterized as The Transformational Society, involves a fundamental paradigm shift that challenges society to balance preservation with the embrace of new technologies (Brandt, et al., 2013). This very phenomenon necessitates that the education system re-evaluate and prepare students for various potential global citizenship dimensions, including climate change, epidemic situations, artificial intelligence replacing human resources in production systems, or altered human interactions, all of which will profoundly impact future human ways of life (Mangkhang & Kaewpanya, 2022). Developing Green Citizenship through the school system is a crucial strategy for preparing youth to cope with rapidly shifting environmental and social crises. Learning that emphasizes fostering environmental awareness, social responsibility, and active participation in problem-solving forms the cornerstone of cultivating high-quality citizens. Schools should be spaces that promote students' understanding of the human-nature relationship and the impact of human actions on ecosystems through integrated theoretical and

practical learning processes, such as community environmental conservation activities, waste problem studies, or promoting a circular economy. Instilling these concepts will nurture environmentally conscious citizens with critical thinking skills, enabling them to adapt and effectively create sustainable solutions for the future.

The Greater Mekong Subregion (GMS) is a rich tapestry of biodiversity and cultural diversity, which has fostered unique local wisdom. This wisdom extends beyond mere subsistence knowledge, such as traditional agriculture, indigenous fishing, or natural resource management aligned with the Mekong Basin's ecosystems. It also encompasses social, cultural, and spiritual dimensions, including performing arts, handicrafts, knowledge of herbal medicine and health, traditions, rituals, and belief systems that reflect the intimate relationship between humans and nature in the region. Preserving and developing this wisdom is crucial for empowering communities to adapt and sustainably cope with various changes, especially in the face of contemporary challenges posed by climate change impacts and development that could affect traditional ways of life. Therefore, studying and understanding the wisdom of the GMS is paramount for designing policies and development approaches that respect local contexts and promote community participation. This will safeguard the cultural value and diversity that form the foundation for sustainable and balanced development in the region (Chaiphiphat, 2008; Sakyapan, 2015; Rampungjit, Phaetlakfa, & Nopudomphan, 2025). The study of indigenous herbal wisdom in the GMS is of utmost importance for the health, economic, and cultural dimensions of communities in this region. This wisdom is not merely knowledge about using plants for treating illnesses, but also includes a deep understanding of ecosystems, the relationships between plants and other living organisms, and the processes of preparing medicines passed down from ancestors. Systematic study will enable the collection, storage, and preservation of this knowledge, preventing its loss over time, while also opening opportunities for research and development to maximize its benefits, such as discovering bioactive compounds for new medicinal applications or promoting health and wisdom tourism. Furthermore, promoting the learning of herbal wisdom also fosters awareness of the value of natural resources and local culture, leading to the sustainable conservation of biodiversity and the traditional way of life of communities in the Mekong Basin.

Therefore, this research aims to study ethno-pedagogy learning management innovation through indigenous herbal knowledge to promote green citizenship of students in the Greater Mekong Subregion (GMS). The goal is to propose guidelines for managing ethno-pedagogy instruction by transmitting indigenous herbal knowledge. This knowledge serves as a learning resource for local flora and their medicinal properties, reflecting the way of life, the human-nature relationship, and ecological interdependence. Such an approach will foster students' deep understanding and awareness of the importance of natural resource conservation, which is fundamental to an environmentally friendly lifestyle. This integration will cultivate a sense of responsibility towards both the community and the planet, a key characteristic of green citizens ready to apply their knowledge for sustainable local

2. Methodology

2.1 Research Form

This research employs a Participatory Action Research (PAR) methodology, an investigative approach focused on fostering learning and change through collaborative efforts between researchers and stakeholders within the authentic context of the study area. Data collection processes were diversified to enhance the reliability and depth of the findings. The initial phase involved document analysis to establish a foundational understanding of relevant conceptual frameworks and existing data. Subsequently, interviews served as the primary tool for gathering qualitative data from participants, providing in-depth access to their perspectives, experiences, and wisdom. Concurrently, assessments were utilized to collect quantitative data, enabling systematic measurement and evaluation of the situation. All collected data will undergo descriptive analysis, integrating both quantitative and qualitative insights. This comprehensive analysis will synthesize and present research findings in a manner that thoroughly and holistically explains the phenomena and contextual issues under investigation.

2.2 Research Area Population and Samples

This research focuses on indigenous communities within the Greater Mekong Subregion (GMS) that actively maintain the transmission of indigenous herbal wisdom. To gain comprehensive and comparative insights, the study selects communities with similar cultural and ecological contexts but located in different countries: Ban Mae Community, Ban Mae Subdistrict, San Pa Tong District, Chiang Mai Province, Thailand, and Ban Nong Tha Tai Community, Chanthabouly District, Vientiane Capital, Lao People's Democratic Republic. This selection allows for an effective analysis of the patterns of inheritance, adaptation, and challenges facing herbal wisdom in a cross-border context, ultimately leading to sustainable approaches for preserving and extending this valuable knowledge.

The study's population comprises three main target groups: 1) Indigenous herbal knowledge transfer process informants, including community leaders and indigenous knowledge holders; 2) Evaluators of the suitability of learning management innovation, consisting of university lecturers, teachers, and ethno-pedagogy experts; and 3) The group piloting the learning management innovation, specifically high school students. The researcher employed specific sampling methods for convenience and to gather data from these samples, resulting in a total of 127 participants:

(1) Indigenous herbal knowledge transfer process informants: 20 individuals, selected using Snowball Sampling.

(2) Evaluators of the suitability of learning management innovation: 7 individuals, selected using Purposive Sampling.

(3) Group piloting the learning management innovation: 100 individuals, selected using Purposive Sampling.

2.3 The Instruments Used in the Study

The instruments used for data collection consisted of:

(1) In-depth interview guide concerning the process of transferring indigenous herbal knowledge in the Greater Mekong Subregion area.

(2) Learning management innovation suitability assessment form.

(3) Green citizenship evaluation form.

(4) Focus group discussion recording sheet.

2.4 Data Collection

(1) Documentary Study: This stage involves collecting data from various documentary sources, including academic papers, books, and journals. The focus is on gathering relevant theories, concepts, and existing research to support the analysis of the study's key issues.

(2) Situational Analysis: This is a crucial process for comprehensively understanding the context of the phenomenon or problem. It primarily relies on qualitative data collection, beginning with a synthesis of relevant documents and research to establish an initial knowledge base and identify data gaps. Subsequently, fieldwork is conducted through in-depth interviews with community leaders and indigenous knowledge holders. This approach aims to access wisdom, experiences, and insightful perspectives directly from real-world stakeholders, ensuring accurate and complete data reflecting the current situation. The primary tool used for this is an in-depth interview guide on the process of transferring indigenous herbal knowledge in the Greater Mekong Subregion area.

(3) Design and Development: This stage involves quantitative data collection focused on designing and developing the ethno-pedagogy learning management innovation through indigenous herbal knowledge to promote green citizenship of students in the Greater Mekong Subregion area. Following development, the quality and suitability of the developed learning management innovation are assessed by experts in learning management. The tool utilized for this is an evaluation form for the suitability of the learning management innovation.

(4) Study of Learning Innovation Outcomes: This stage entails quantitative data collection through the implementation of the ethno-pedagogy learning management innovation through indigenous herbal knowledge to promote green citizenship of students in the Greater Mekong Subregion area in actual classroom settings. This innovation will be piloted with upper secondary students in schools within the Greater Mekong Subregion. Subsequently, students' green citizenship will be assessed using a dedicated green citizenship evaluation form.

2.5 Data Analysis

(1) Qualitative Data: The research team analyzed qualitative data obtained from document analysis and interviews through interpretation. This method allowed for a deep understanding of the data's meaning and context. The analysis focused on summarizing key issues based on categorized data groups and examining the interrelationships among these data points. This process will lead to findings and conclusions that fully align with the study's objectives.

(2) Quantitative Data: The research team analyzed quantitative data collected from evaluation forms using appropriate statistical software. This analysis involved the application of descriptive statistics, which aimed to summarize and describe the characteristics of the sample data. The results of the analysis will be presented in terms of mean values to indicate central tendency and standard deviation to reflect data dispersion.

3. Results

In this research, researchers divided data derived from the study and presented the results of the research according to the aims. The results are showed as follows:

3.1 Study the Process of Transferring Indigenous Herbal Knowledge in the Greater Mekong Subregion Area

The study of the process of transferring indigenous herbal knowledge in the Greater Mekong Subregion area revealed that this process can be categorized into three approaches: 1) the transfer of indigenous herbal knowledge for medicinal purposes, 2) the transfer of indigenous herbal knowledge for culinary purposes, and 3) the transfer of indigenous herbal knowledge for cosmetic purposes. The details are as follows:

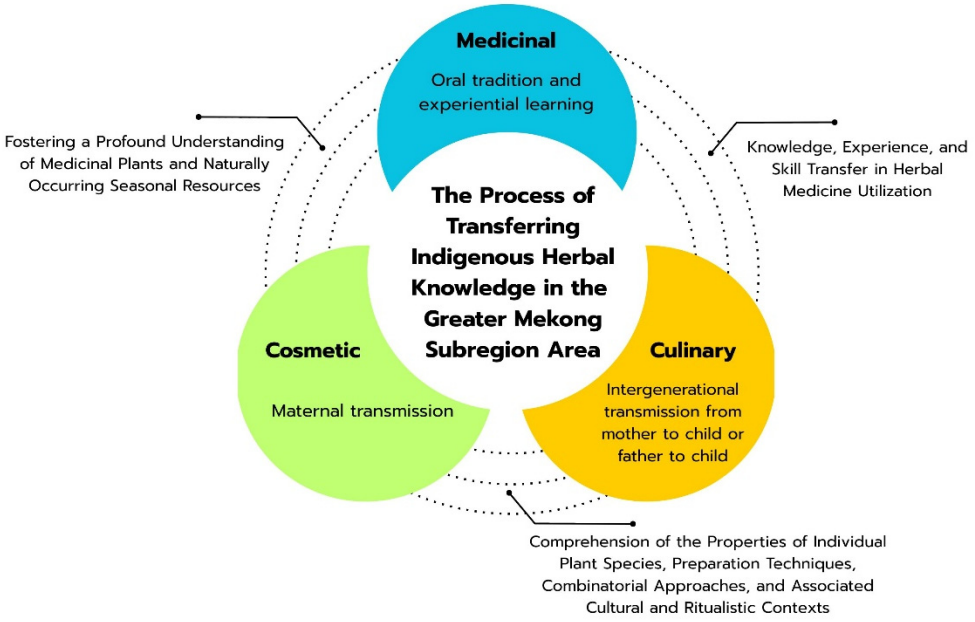

Figure 1 The Process of Transferring Indigenous Herbal Knowledge in the Greater Mekong Subregion Area

Source: Phuwanatwichit, Sarobol & Syharath (2025)

(1) Process of transferring indigenous herbal knowledge for medicinal use

The process of transferring indigenous herbal knowledge for medicinal use in the Greater Mekong Subregion communities is a vital mechanism for preserving traditional knowledge. This process is characterized by oral tradition and learning by doing, with "indigenous knowledge holders" or traditional healers serving as the central figures in passing down their knowledge, experience, and practical skills in herbal use to their descendants, apprentices, or interested community members without discrimination. This transmission is not limited to mere recipes or preparation methods; it also encompasses philosophical beliefs about nature, auspicious timings, and ethical principles of healing. Those who receive this knowledge must demonstrate a firm commitment to preserving and continuing this wisdom to prevent the loss of these invaluable insights. Continuously encouraging community members to integrate herbal remedies into their daily lives through learning activities, workshops, or supporting home-based herbal cultivation helps keep this wisdom vibrant, a living part of their lifestyle, and ensures sustainable health security for the community.

(2) Process of transferring indigenous herbal knowledge for culinary use

The process of transferring indigenous herbal knowledge for culinary use in the Greater Mekong Subregion reflects significant cultural dynamics, particularly through its primary mechanism of transmission from mother to child or father to child, which is crucial for preserving traditional knowledge. This wisdom is not merely conveyed through theoretical explanations; it heavily emphasizes practical learning through cooking and preparation in the household, forming an integral part of daily life. Communities in the Mekong Basin have developed a profound understanding

of indigenous herbs and natural ingredients available in each season, applying them to create culinary dishes with nutritional value and medicinal properties. This hands-on transmission within the household allows learners to naturally absorb techniques, methods, and the rationale behind using each herb. This results in learning that transcends rote memorization, instead fostering a blend of empirical knowledge and direct experience, which is fundamental to the community's existence and adaptation within its changing ecological context.

(3) Process of transferring indigenous herbal knowledge for cosmetic use

The process of transferring indigenous herbal knowledge for cosmetic use in many communities, especially within the Greater Mekong Subregion, often manifests as mother-to-daughter transmission. This highlights the significant role of women as guardians and disseminators of this knowledge. Consequently, this wisdom is more commonly observed and utilized among women than men, as it directly pertains to women's daily beauty and hygiene practices. This transfer involves more than just passing down recipes or methods for using herbs; it also includes an understanding of each plant's properties, preparation techniques, blending methods, and associated cultural and ritualistic contexts. The continued existence of these practices from the past to the present in these communities demonstrates the sustainability and importance of herbal wisdom as an integral part of community life and culture, reflecting deeply rooted values that are consistently recognized and applied in the daily lives of local people.

3.2 The Design and Develop an Ethno-Pedagogy Learning Management Innovation Through Indigenous Herbal Knowledge to Promote Green Citizenship of Students in the Greater Mekong Subregion Area

In designing and developing the ethno-pedagogy learning management innovation through indigenous herbal knowledge to promote green citizenship of students in the Greater Mekong Subregion area revealed that the research team analyzed the process of transferring indigenous herbal knowledge in the Greater Mekong Subregion through extensive fieldwork and immersive, in-depth studies. Subsequently, they designed a learning management innovation, a process innovation termed CMIL of learning management approach through indigenous herbal knowledge, with the following details:

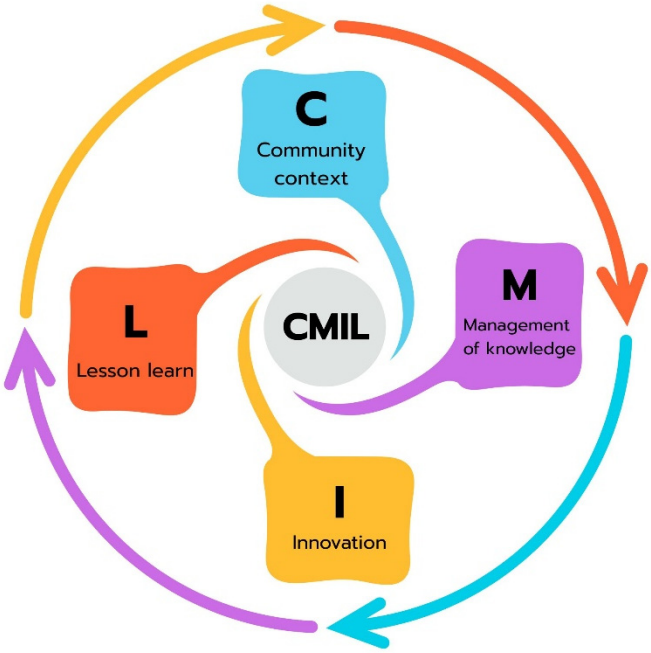

Figure 2. CMIL of Learning Management Approach Through Indigenous Herbal Knowledge

Source: Phuwanatwichit, Sarobol & Syharath (2025)

Step 1 Community context: C, Community context learning is a crucial foundational step in holistic learning management planning. It aims for an in-depth understanding of the target area, beginning with defining a community of interest for study. This could be a community notable for its culture, indigenous wisdom, or compelling challenges. The process then moves to a comprehensive initial community context study through fieldwork. This involves not only interviewing key individuals or experienced community members but also immersion within the

community and participant observation. These methods allow learners to access in-depth information and genuinely understand the community's way of life, beliefs, values, and social interactions. The primary goals are to study the general community context, interactions among community members, social networks, and to identify and comprehend local wisdom, such as herbal knowledge, traditional production methods, or local resource management. Techniques like transect walks/community mapping can be applied to enhance learning efficiency, providing a clearer overview and detailed insights into the area, including the distribution of resources and knowledge. Once data is thoroughly collected, the next step is to systematically compile and analyze the information according to predefined topics. This leads to crystallized knowledge, which then proceeds to knowledge management for future utilization.

Step 2 Management of knowledge: M, in the context of indigenous herbal wisdom education is a crucial process that links empirical data from fieldwork with the systematic creation of actionable knowledge. The initial stage of this KM involves gathering community contextual information related to herbal wisdom, particularly data on the intergenerational transfer of knowledge, which is often nuanced and abstract. After data collection, the process moves to organizing and classifying information based on three main themes: 1) the process of transferring indigenous herbal knowledge for medicinal use, which includes diagnostic methods, herb selection, medicine preparation, and treatment of various ailments; 2) the process of transferring indigenous herbal knowledge for culinary use, covering the incorporation of herbs into healthy cooking, food preservation, or as tonics; and 3) the process of transferring indigenous herbal knowledge for cosmetic use, which encompasses recipes and methods for using herbs in skincare, haircare, and other beauty applications. In this process, the student's role is critical, as they must analyze, interpret, and categorize the field data to clearly and systematically delineate this knowledge. Analyzing the data helps students understand transfer patterns, factors influencing the preservation or change of wisdom, and the value and significance of herbs in each context. This managed and categorized information then forms a vital knowledge base, which is used in subsequent learning stages. Therefore, this KM process is not merely data collection but also an opportunity for in-depth learning and maximizing the benefits of indigenous wisdom for community development.

Step 3 Innovation: I, is a crucial step that bridges traditional knowledge with novel creations, enhancing the value and significance of that wisdom. At this stage, learners are encouraged to apply the indigenous herbal knowledge they have gathered and managed to design and develop creative concepts, practical products, or even functional prototypes. The primary goal is to modernize this wisdom to meet community needs and expand its benefits to create economic and social value. During this phase, students acquire diverse skills, including systematic project planning, user-centered and aesthetically pleasing design, quality product development, and collaborative teamwork. This collaboration extends to working with community members and interacting with educational partners such as local administrative organizations, temples, or universities to seek advice and exchange knowledge, thereby building robust cooperative networks. After developing their work, learners have the opportunity to present their creations in exhibition format to exchange knowledge with classmates, the community, and other interested parties. This stage incorporates a creative learning assessment process using various methods, such as evaluating actual workpieces, presentations, or reflection on learning outcomes. This comprehensive evaluation ensures holistic student development and fosters sustainable learning.

Step 4 Lesson learn: L, is a crucial process within experiential learning and a continuous development approach. It actively engages both instructors and learners in sharing their learning experiences, including notable successes, obstacles, problems, and challenges encountered during a specified process or activity. This process goes beyond merely identifying mistakes; it also involves discovering factors that contributed to success and analyzing areas for future improvement. Lesson learned can be conducted using various methods to suit the context and needs of the learners, such as group discussions to encourage diverse perspectives, reflective writing to deepen students' thoughts, or sharing via digital media to enhance information presentation. The ultimate goal of this process is to create a safe space for sharing not only knowledge and skills gained from practice but also students' feelings, including anxieties, disappointments, pride, or inspiration. This ensures everyone feels acknowledged and can genuinely learn from shared experiences, ultimately leading to sustainable capacity building and the creation of new knowledge.

Table 1. Teacher and Student Roles in CMIL of Learning Management Approach Through Indigenous Herbal Knowledge

CMIL	Teacher Roles	Student Roles
Step 1 Community context	1. Establishing Learning Directives and Objectives: The educator initiates the process by identifying suitable and engaging community areas for study. Concurrently, clear and specific primary objectives for understanding the community context are defined. 2. Designing the Learning Process: Educators play a crucial role in planning and designing learning activities that facilitate in-depth exploration and comprehension of the community context. This includes planning fieldwork, introducing data collection techniques, and fostering participatory learning. 3. Providing Guidance and Support: The educator guides students in accessing information, conducting interviews with key individuals, immersing themselves in community life, and engaging in participant observation. Furthermore, they provide consultation on applying various techniques, such as transect walks or community mapping, to enhance learning effectiveness. 4. Promoting Data Analysis and Synthesis: Educators encourage students to systematically organize and analyze collected data to foster knowledge crystallization. This process aims to lead to knowledge management for future utilization. 5. Cultivating a Secure and Collaborative Learning Environment: The educator establishes a space where students feel secure to explore, pose questions, and share insights gained from their community-based learning experiences.	1. Exploring and Understanding the Community Context: Students play a pivotal role in comprehensively examining the foundational context of a community through fieldwork. This encompasses in-depth interviews, community immersion, and participant observation to gain profound insights into the local way of life, beliefs, values, and social interactions. 2. Data Collection and Documentation: Students systematically gather information concerning the general community context, member interactions, social networks, and indigenous knowledge prevalent within the community. All data collected is meticulously recorded and organized. 3. Application of Tools and Techniques: Students apply techniques and tools recommended by educators, such as community mapping, to explore and comprehend the area. This provides a holistic and detailed understanding of the locale, including the distribution of resources and knowledge. 4. Data Organization, Analysis, and Synthesis: Students are instrumental in systematically organizing and analyzing the collected data according to predefined categories. This process leads to the crystallization of knowledge and facilitates subsequent knowledge management initiatives. 5. Reflection on Learning Outcomes: Students actively engage in reflecting on their learning outcomes and presenting their findings from the community study. This fosters knowledge exchange with peers and educators.
Step 2 Management of knowledge	1. Framework and Key Themes for Knowledge Management: Teachers are responsible for defining the direction and structure of information management. Specifically, they delineate three primary themes: medicinal, culinary, and cosmetic applications. This provides students with a clear framework for data collection and organization. 2. Guidance and Support for Data Analysis: While the provided information implies student involvement in analysis, it is implicitly understood that teachers must provide guidance, direction, and support to students in analyzing, interpreting, and categorizing information. This ensures that the classification of knowledge is accurate and systematic. 3. Fostering Opportunities for In-Depth Learning: Teachers are instrumental in creating and preparing an environment conducive to in-depth student learning. This also includes facilitating the application of	1. Community Contextual Data Collection: Students engage in fieldwork to gather empirical data concerning local herbal wisdom, with a particular focus on the intergenerational transmission of knowledge. 2. Data Organization and Classification: Following data collection, students systematically organize and classify the information according to predefined key thematic areas (medicinal, culinary, and cosmetic applications). 3. Data Analysis, Interpretation, and Categorization: This crucial student role involves analyzing, interpreting, and categorizing the fieldwork data to clearly and systematically delineate the acquired knowledge. This includes understanding transmission patterns, factors influencing the preservation or transformation of indigenous wisdom, and the significance of herbs

CMIL	Teacher Roles	Student Roles
	indigenous knowledge, derived from knowledge management, for subsequent community development initiatives.	within each respective context. 4. Knowledge Base Construction: The meticulously managed and categorized data then forms a vital knowledge base, which will be utilized for subsequent learning phases, thereby establishing a systematic and practically applicable body of knowledge.
Step 3 Innovation:	1. Promoting Indigenous Herbal Wisdom in Educational Settings Here's an academic rendering of the provided points, focusing on the role of educators in fostering creativity and collaboration, particularly in the context of indigenous herbal wisdom: 2. Stimulating and Encouraging Application of Prior Knowledge: Educators should actively encourage students to apply their existing knowledge, especially regarding indigenous herbal wisdom, to the creation of novel concepts, products, or prototypes. This process fosters innovative design and development. 3. Providing Guidance and Support: Teachers ought to offer comprehensive consultation and advice on project planning, design methodologies, and the qualitative development of student work. Furthermore, they should facilitate teamwork to ensure that students' endeavors proceed smoothly and efficiently. 4. Fostering Collaborative Networks: Educators play a crucial role in connecting students with relevant educational and community partners. These partnerships might include local government organizations, religious institutions (e.g., temples), or universities. Such connections enable students to receive expert advice, engage in knowledge exchange, and build robust collaborative relationships. 5. Facilitating Presentation and Evaluation: Teachers should create diverse opportunities for students to showcase their work, such as through exhibitions. These platforms encourage peer learning and allow for the implementation of creative learning assessments based on tangible products, presentations, or reflections on the learning process. This approach promotes comprehensive and sustainable student development.	1. Application of Knowledge: Students are required to apply knowledge acquired through the collection and organization of information pertaining to indigenous herbal remedies. This application should manifest in the design and development of innovative concepts, products, or prototypes possessing practical utility. 2. Development of Diverse Skills: Students must acquire and practice essential skills, including but not limited to project planning, user-centered and aesthetic design, and the qualitative development of their work. 3. Collaborative Engagement: Students are expected to engage in collaborative work with their peers, community members, and educational partners. This collaboration should facilitate knowledge exchange and the co-creation of outputs. 4. Presentation and Assessment: Students are responsible for presenting their work, typically in an exhibition format, to foster knowledge exchange. Furthermore, they will undergo creative learning assessments utilizing diverse methodologies, the results of which will inform continuous self-improvement.
Step 4 Lesson learn	1. Establishing and Providing Safe Spaces: Teachers must actively cultivate an atmosphere conducive to the open sharing of experiences, thoughts, and feelings, free from apprehension or judgment. This empowers students to express themselves fully and authentically. 2. Stimulating and Encouraging Participation: It is the teacher's responsibility to motivate students to actively engage in sharing their experiences, encompassing successes, obstacles, problems, and challenges they have encountered.	1. Openly Share Experiences: Students must actively participate in sharing their learning experiences, encompassing successes, obstacles, problems, and challenges encountered. 2. Reflect and Analyze: Students should utilize the debriefing process to reflect on their thoughts, analyze what occurred, and identify factors influencing outcomes, as well as areas for improvement. 3. Express Emotions: Students should be

CMIL	Teacher Roles	Student Roles
	3. Facilitating Lesson Derivation: Educators should introduce and guide students through diverse methods for deriving lessons from their experiences, tailored to the context and needs of the learners. This can include, but is not limited to, group discussions, written reflections, or sharing through digital media. 4. Promoting Analysis and Crystallization: Teachers are tasked with encouraging students to analyze factors contributing to their successes and identify areas for future improvement, moving beyond merely pinpointing mistakes. 5. Active Listening and Validating Emotions: Teachers should listen openly and acknowledge students' feelings, whether they are concerns, disappointments, pride, or inspirations. This ensures students feel validated and understood.	encouraged to share emotions related to their learning experiences, such as concerns, frustrations, pride, or inspiration, to facilitate shared learning. 4. Learn from Shared Experiences: Students should be open to learning from both their own and others' experiences, leading to sustainable potential development and the creation of new knowledge. 5. Select Appropriate Debriefing Methods: Students can choose debriefing methods that are suitable for their individual needs and context to maximize the effectiveness of their reflection.

Source: Phuwanatwichit, Sarobol & Syharath (2025)

After developing the learning management innovation, the research team proceeded to evaluate its suitability. This evaluation was conducted by experts in learning management, and the results are presented as follows.

Table 2. Assessment of the Suitability of Ethno-Pedagogy Learning Management Innovation Through Indigenous Herbal Knowledge to Promote Green Citizenship of Students in the Greater Mekong Subregion area (n=7)

Evaluation Item	Mean	SD	Interpretation
1. The learning management innovation responds to the needs of the educational institution and local knowledge.	4.80	0.45	Highest
2. The learning management innovation promotes awareness of the importance of local wisdom education through the transfer of herbal knowledge.	4.60	0.55	Highest
3. The learning management innovation enhances understanding of place-based learning consistent with students' local identity.	4.40	0.89	High
4. The learning management innovation fosters local consciousness and appreciation for local wisdom.	4.80	0.45	Highest
5. The learning management innovation provides opportunities for students to learn through hands-on practice.	4.60	0.89	Highest
6. The learning management innovation instills pride in children and youth as active citizens of the local community.	4.80	0.45	Highest
7. The learning management innovation promotes creative thinking.	4.20	1.10	High
8. The learning management innovation has processes appropriate for the content of local wisdom education through the transfer of herbal knowledge, fostering "green citizenship" among students.	4.80	0.45	Highest
9. The learning management innovation includes learning activities that encourage discussion and exchange of ideas to find common solutions.	4.60	0.89	Highest
10. The learning management innovation demonstrates flexibility in its appropriate application for learning and practical implementation in the classroom.	4.40	0.55	High
Overview	**4.60**	**0.67**	**Highest**

Table 2 demonstrates that the developed ethno-pedagogy learning management innovation, which utilizes indigenous herbal knowledge to promote green citizenship among students in the Greater Mekong Subregion, is highly appropriate overall (M = 4.60, SD = 0.67). A detailed item-by-item analysis revealed four key aspects that received

the highest evaluation scores (M= 4.80): 1) the innovation's responsiveness to the needs of educational institutions and local knowledge; 2) its effectiveness in fostering local consciousness and appreciation for local wisdom; 3) its capacity to instill pride in children and youth as active citizens of their local community; and 4) its appropriate processes for integrating local wisdom education through the transfer of herbal knowledge to cultivate "green citizenship" among students. These findings collectively indicate that the ethno-pedagogy learning management innovation, grounded in indigenous herbal knowledge for fostering green citizenship in the Greater Mekong Subregion, is highly suitable for implementation in classroom settings.

3.3 Investigate the Results of Using the Ethno-Pedagogy Learning Management Innovation Through Indigenous Herbal Knowledge to Promote Green Citizenship of Students in the Greater Mekong Subregion Area

The study of the results of using the ethno-pedagogy learning management innovation through indigenous herbal knowledge to promote green citizenship of students in the Greater Mekong Subregion area, revealed that the research team implemented a learning process based on a learning management innovation. Subsequently, green citizenship was assessed among secondary school students who had engaged in an ethno-pedagogy learning management innovation through indigenous herbal knowledge to promote green citizenship of students in the Greater Mekong Subregion area. The observed levels of green citizenship are as follows:

Table 3. Evaluation of Student Green Citizenship Levels (n=100)

Evaluation Item	Mean	SD	Interpretation
1. Students recognize that environmental stewardship is the responsibility of every citizen in society.	4.65	0.57	Highest
2. Students understand what it means to be an environmentally friendly citizen.	4.52	0.64	Highest
3. Students understand that green citizenship necessitates not considering advantages or disadvantages when participating in the protection, preservation, and care of natural resources and the environment.	4.35	0.72	High
4. Students regularly follow environmental news and disseminate such information to those around them and to electronic communities.	3.99	0.78	Moderate
5. Students know and understand the changes and impacts of environmental problems.	4.35	0.76	High
6. Students cooperate in planting trees and increasing green spaces in schools and communities.	4.40	0.82	High
7. Students participate in tree planting activities on national holidays and community traditional days.	4.12	1.02	High
8. Students maintain cleanliness in schools and communities.	4.47	0.71	High
9. Students choose environmentally friendly products.	4.25	0.84	High
10. Students reduce waste by using cloth bags and refuse to use plastic bags in their daily lives.	4.19	0.72	High
11. Students are aware of the changes and impacts of environmental problems.	4.45	0.72	High
12. Students consistently adhere to school and societal agreements regarding the environment.	4.40	0.72	High
13. Students are proud of, appreciate, and actively participate in the conservation and inheritance of Thai wisdom and the environment.	4.44	0.71	High
14. Students strategize and plan environmental solutions for their school, community, and society.	4.19	0.84	High
15. Students believe that addressing environmental problems is everyone's responsibility in society.	4.61	0.68	Highest
Overview	**4.35**	**0.75**	**High**

Table 3 reveals that the overall assessment of students' green citizenship was at a high level (M = 4.35, SD = 0.75). A more detailed item-by-item analysis indicated that three specific aspects of green citizenship were rated at the highest level: 1) Students recognize that environmental stewardship is the responsibility of every citizen in society; 2) Students understand what it means to be an environmentally friendly citizen; and 3) Students believe that addressing

environmental problems is everyone's responsibility in society. These findings suggest that the ethno-pedagogy learning management innovation, utilizing indigenous herbal knowledge, is effective in promoting students' green citizenship within the Greater Mekong Subregion.

4. Discussion

4.1 Study the Process of Transferring Indigenous Herbal Knowledge in the Greater Mekong Subregion Area

The study of the process of transferring indigenous herbal knowledge in the Greater Mekong Subregion area can be categorized into three approaches: 1) the process of transferring indigenous herbal knowledge utilized for medicinal purposes, 2) the process of transferring indigenous herbal knowledge utilized for culinary purposes, and 3) the process of transferring indigenous herbal knowledge utilized for cosmetic purposes. This aligns with Intharathep, Sripuna, & Cherdkotha (2017), who stated that the transmission of indigenous wisdom regarding environmentally friendly herbal medicine for daily life primarily targets family members and close associates, thereby disseminating herbal knowledge into the community. This transmission occurs through oral instruction and practical training provided by knowledgeable individuals. Furthermore, Promsaluay (2020) proposed that the transmission of local wisdom constitutes a body of knowledge acquired through dedicated practice, passed down through generations, and integrated into the way of life of people in specific areas. Its application holds diverse meanings, contingent upon social context, regional variations, and the acceptance of this wisdom within the community's environmental framework. Additionally, Muangin et al. (2022) further elaborated that the transmission of wisdom originates from ancestors, with some knowledge also being conveyed by indigenous knowledge holders. Regarding the internal factors influencing the preservation of local wisdom, traditional medical systems are paramount, followed by aspects of traditional culture and subsistence production. As for external factors impacting the preservation of local wisdom, these were not fully described in the provided text.

4.2 The Design and Develop an Ethno-Pedagogy Learning Management Innovation Through Indigenous Herbal Knowledge to Promote Green Citizenship of Students in the Greater Mekong Subregion Area

In designing and developing the ethno-pedagogy learning management innovation through indigenous herbal knowledge to promote green citizenship of students in the Greater Mekong Subregion area, it was found that the research team designed a learning management innovation called CMIL of learning management approach through indigenous herbal knowledge, which was deemed to be at the highest level of appropriateness. This aligns with Sriwilai's (2002) concept, which posits that learning management focused on local wisdom and community culture is highly relevant and essential for students within that community. The active participation of local residents as knowledge transmitters in the learning activities fostered a sense of pride and joy among them, stemming from their ability to contribute to the community and witness the continuation of their traditional wisdom. Furthermore, engaging students in the practical application of indigenous knowledge and understanding community culture led to the community's recognition of the students' capabilities. This, in turn, positively impacts the students' ability to live within the community with a deeper cultural understanding and to become cultural inheritors. This finding is consistent with Mangkhang et al.'s (2015) study, which suggests that education for robust local communities must address student needs and empower them to appreciate and comprehend community culture and local identity. Such an approach enables students to independently design their learning, fostering a process of community learning and encouraging them to explore methods for developing and extending community culture into creative media innovations to promote strong local citizenship and communities. This also resonates with Vijitpanya's (2017) concept of cultural ecology, which emphasizes cultural ecology as a crucial framework for understanding both the physical and cultural aspects of a place. It underscores the importance of appropriately adapting the environment to facilitate co-existence. Cultural ecology thus reflects identity, indicating the uniqueness, value, and significance of an area in terms of both natural and cultural environments, thereby enhancing understanding of the intricate relationship between the population, social environment, and physical characteristics within a society.

4.3 Investigate the Results of Using the Ethno-Pedagogy Learning Management Innovation Through Indigenous Herbal Knowledge to Promote Green Citizenship of Students in the Greater Mekong Subregion Area

The study of the results of using the ethno-pedagogy learning management innovation through indigenous herbal knowledge to promote green citizenship of students in the Greater Mekong Subregion area revealed that students exhibited a high level of green citizenship. This aligns with Rudhumbu, Zhou & Nhundu (2013), who propose that green citizens seek to foster local collaboration and a shared vision for community prioritization. Social capital plays a fundamental role in empowering communities and encouraging participation, inspiring others through knowledge and attitudes that promote environmental conservation and appreciation. Furthermore, Mangkhang, et al. (2018)

offers a perspective on developing green citizenship, defining it as a diverse concept and environmental practice that emphasizes a human-centered development process, cultivating intrinsic environmental consciousness by "planting people" before "planting forests." This approach aims to foster an understanding of environmental rights within communities, leading to citizens with a strong future orientation. Additionally, Melaville et al. (2015) state that a key characteristic of green citizens is their ability to build local collaborations and shared visions, actively encouraging others to recognize environmental responsibilities through knowledge and attitude shifts that promote prudent consumption behaviors. Green citizens must possess distinct psychological motivations beyond simply conserving resources; they must recognize their connection to nature and be inspired to support environmental stewardship. Ultimately, green citizens need to cultivate and demonstrate environmental citizenship, effectively exercising their valuable environmental responsibilities.

5. Conlusion

The research established that the transmission of indigenous herbal knowledge within the Greater Mekong Subregion (GMS) is systematically categorized into three principal applications: medicinal, culinary, and cosmetic use, underscoring the deep integration of this wisdom into daily life. Transmission occurs primarily through oral tradition and learning by doing, with traditional knowledge holders (healers, mothers, or fathers) acting as critical conduits to pass down practical skills, philosophical beliefs, and ethical principles to younger generations and community members. Based on this ethnographic analysis, the researchers designed and developed an ethno-pedagogy learning management innovation termed CMIL. This model, structured around Community context (C), Management of knowledge (M), Innovation (I), and Lesson learned (L), provides a systematic framework for translating local wisdom into actionable knowledge and practical creation. The CMIL approach was overwhelmingly deemed highly appropriate by experts, validating its effectiveness in aligning educational needs with local knowledge, promoting cultural appreciation, and fostering the capacity for students to become active, proud community citizens. Subsequent implementation revealed that the innovation was highly effective in cultivating Green Citizenship among GMS students, particularly strengthening their conviction that environmental stewardship and addressing environmental problems are the shared responsibilities of every societal member. This evidence suggests that integrating place-based, ethno-pedagogical methods centered on indigenous wisdom is a highly suitable and powerful strategy for fostering an essential, action-oriented environmental consciousness in students.

6. Suggestions

6.1 Suggestions for Implementing Research Results

6.1.1 It is recommended to promote the creation of documentation to establish an electronic database of herbal wisdom and to develop learning media within the community. This initiative aims to create a robust knowledge base and a valuable learning resource.

6.1.2 Collaboration between educational institutions and local communities should be fostered to enhance the effectiveness of local wisdom management in learning processes.

6.1.3 Partnerships with universities should be pursued to further develop herbal products, thereby generating economic value for local communities

6.2 Suggestions for Next Research

6.2.1 Future research should focus on developing learning management innovations for individuals with disabilities and for informal education. This will facilitate learning processes that can lead to tourism innovation and income generation for learners within educational innovation areas.

6.2.2 A needs analysis should be conducted for the development of local wisdom curricula that integrate other relevant local content.

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